Tennessee Valley Authority

Managing the Valley's Water Supply

Elasticity of Demand for Barged Grain Shipments on the Upper Mississippi River and Illinois Waterways

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History of Willingness to Pay (WTP)/Elasticity Studies at TVA

- **2002 survey of shippers, carriers and others**
- **Equation estimations with TVA cross-section data**
- **Focus Groups on the Mississippi River**
- **Equation estimations for grain shipments on the upper Mississippi River and Illinois Waterway**

The WTP Survey

- **133 usable survey forms were obtained from shippers, towing companies, terminals, and from other venues**
- **All shippers were surveyed on the Tennessee River and a sample (20) of the major shippers were surveyed on the Ohio River**
- **Study co-funded by TVA and Huntington District of the USACE**

The 2002 WTP Survey Sought to Gain Information Regarding:

- **Commodity market responses to waterway cost changes**
- **Factors affecting shipper modal decisions**
- **Factors that determine shipper behavior**
- **Significance of alternative markets**

Survey Findings

- **Shipping decisions are not generally made based on transportation rates alone**
- **Maximum WTP depends on shipper preferences, need compatibility, safety, and shipper size**

The Major Exceptions Where Shipments are Sensitive to Waterway Cost

- **Grains processed at off-river locations where a truck haul is needed**
- **High value commodities in small to medium sized lots and not dangerous to the environment**

Estimation Results with Cross Sectional Data and Implications

- **Estimation using various functional forms yielded NO statistically significant results**
- **One could argue that the lack of correlation between rates and quantities is consistent with survey results**
- **If true, the survey / estimation results suggest a fundamental disconnect between theory and actual shipper practices**

Time Series Equations

- **Could elasticities be estimated with time series data?**
- **The data were available to estimate equations for grain shipments on the Mississippi River and Illinois Waterway**
- **100 million bushels of grain move on Tennessee off the Mississippi and Illinois Rivers**

Study Objectives

- **Build and estimate a model that approximates how growers and shippers make transportation decisions, regarding:**
  - **Domestic grain consumption**
  - **Transportation Competition**
  - **Commodity prices**
  - **Barge cycle time**

Qualitative Information Was First Collected

- **Conducted grain growers focus groups regarding barging on the Upper Mississippi and Illinois Rivers**
- **Interviewed terminal operators on the Upper Mississippi and Illinois Rivers**

Quantitative (Secondary) Data was Processed

- **Monthly tonnage tabulations of corn and soybean traffic provided by the USACE Waterborne Commerce Statistical Center 1990-2000**
  - **Data summed by TVA to four ranges of the Upper Mississippi River and Illinois Waterway by month**
  - **Empty barge movements by reach came from USACE WCSC lite data**
- **Export grain inspection quantities and percent of tariff rates provided by USDA**

Assisted USDA with River Tonnage Data

- **River traffic data were provided to Texas A&M at the request of USDA.**
- **Aggregated in publicly releasable form**

The Study Considered the Changing Roles of ---

- **Country elevators, trucking, railroads, contracting, farm size, barge draft, local markets and production.**

Model is Unique

- **Allows for relationship between shipments and price to be nonlinear**
- **Prices enter model as the least of (Chicago Board of Trade Price-Price at NOLA) less barge transportation to either**
- **Empty barge movements reflect cycle times**

Estimated Models

- **A total of four equations representing each river range**
- **Three equations for the Mississippi River and one equation for the Illinois River**
- **All models are statistically significant**
- **Price-rate variable is statistically significant in all equations**
- **No model has an $R^2 < .70$**

Puts Focus on Modal Substitution

- **Impacts of Alternative origins and destinations are minimized by the farmer contracting grain sales and other factors**
- **Regional markets are not a significant factor in the demand for grain in the relevant market area.**
- **Modal substitution is thus the principal alternative to river transportation.**

Country Elevators are **Dead**

Augusta, Missouri

Elasticities by Reach of River System

- **-0.72 For Reach One**
- **-0.32 For Reach Two**
- **-0.57 For Reach Three**
- **-0.42 For Reach Four**

Results:

- **Confirm Texas A&M findings**
- **Provide a more robust model**
- **Are consistent with the qualitative results**

QUESTIONS?